BELFORT INSTRUMENT

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DigiNx®
Automated Weather Observing System AWOS

System Description

Proprietary

Prepared in Response to

FAA, Automated Weather Observing System (AWOS) Requirements

July 2005

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1.0 Introduction

1.1 Purpose – This manual has been prepared to identify the hardware components to the lowest field replaceable unit, describe system hardware and software principles of operation and describe how they are integrated within the system.

1.2 Scope – This manual has been prepared to comply with the guidance and requirements of FAA Advisory Circular, AC No. 150/5220-16C and other referenced documents.

1.3 System Overview and Description – The DigiWx™ system is an FAA approved, special configuration AWOS with dual-pressure sensors and visibility sensors for reporting official altimeter settings and visibility measurements in addition to other advisory information. It is a fully automated aviation weather observing and reporting system designed to support airborne and ground users. The DigiWx system is modular and may be installed in a number of configurations (see Table 1). A full DigiWx™ system consists of FAA approved barometric pressure sensors and a visibility sensor. The system may contain additional advisory sensors such as wind speed, wind direction, temperature, and humidity sensors mounted on a rugged, aluminum tilt-over tower. Sensor readings are monitored and processed by a digital processor located in the DCP enclosure. The processor uses sensor data to calculate the prevailing and gust wind components for pre-programmed runway headings. Depending on the system sensor configuration purchased, the DigiWx™ system calculates the altimeter setting, density altitude, condensation altitude, and dew point. All of this information plus the speed and direction of prevailing wind and wind gusts, current surface temperature and visibility are broadcast on UHF 464 MHz by a FCC licensed transceiver located in the DCP enclosure. Through DigiWx Advisor software and a Digital Data Receiver (DDR), the weather information and any NOTAMs are communicated to users by Pilot Activated Unicom or an Endless Loop Dedicated Frequency (ELDF) on a dedicated VHF frequency. An internet option and dial up voice modem allow remote users to access the information. The system also reports weather conditions to pilots in the air through the DigiWx™ AWOS Hand-Held Display Unit (HHDU). The pilot receives this information at ranges up to 10 miles from the airport. In order to get the weather information, the pilot only has to power up the hand held display and select the runway heading that he/she will use. In addition to alphanumeric readouts of the various weather parameters, the hand held unit provides a graphical representation of the selected runway with the head, tail and/or cross wind components displayed thereon. DigiWx™ system software design also incorporates plug and play simplicity for ease of installation and maintenance, and an intuitive interface for ease of operation.

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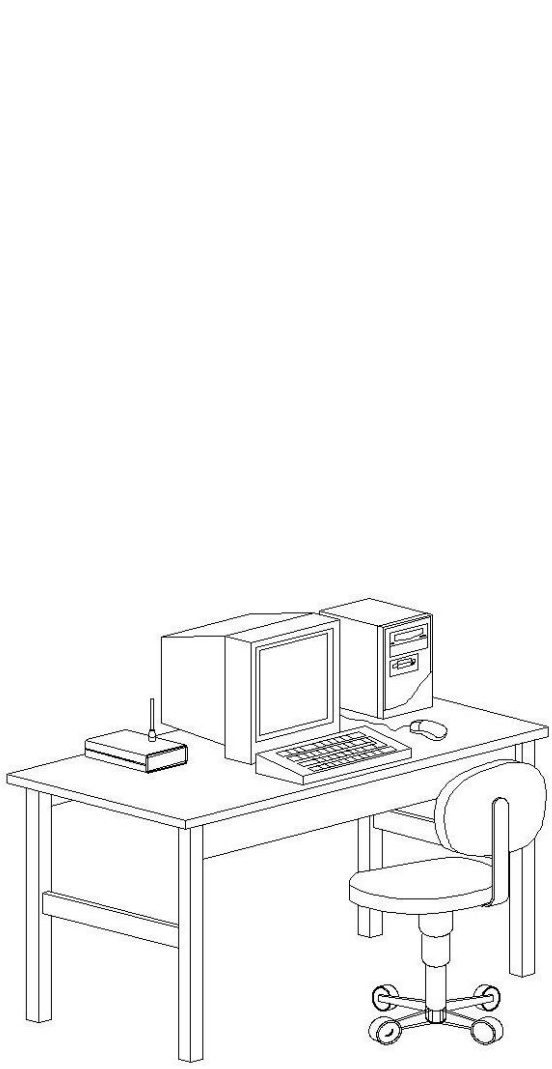
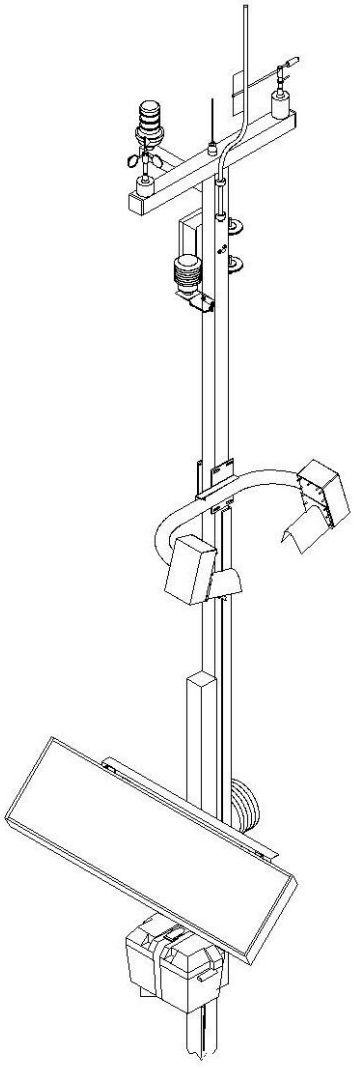
1.4 System Configuration

Figure 1a illustrates a typical DigiWx installation with all sensor options installed and the solar power option added.



Interior DigiWx Data Acquisition Terminal Unit



Exterior DigiWx Tower

Figure 1
Interior and Exterior System Components

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The system is modular and may be deployed in a number of configurations depending on the sensors selected, the mounting method, and the output options as shown in the following table.

DigiWx Sensor and Data Distribution Configurations							
Data Distribution Options	Sensor Configurations						
		DCP Dual Baro Wall Mount	DCP Dual Baro Tower Mount	DCP Dual Baro Tower Mount Visibility Day/Night	DCP Dual Baro Tower Mount Wind Speed and Direction Temperature and Dew point	DCP Dual Baro Tower Mount Wind Speed and Direction Temperature and Dew point Visibility with Day/Night Sensor	DCP Dual Baro Wind Sock Mount Wind Speed and Direction Temperature and Dew point Visibility with Day/Night Sensor
	Code	BNT	B	BV	W	V	S
Handheld (HHDU) **	H	BNT-H	B-H	BV-H	BW-H	BWV-H	BWS-H
DigiWx Advisor – FBO	A1	BNT-A1	B-A1	BV-A1	BW-A1	BWV-A1	BWS-A1
DigiWx Advisor - FBO – Internet	A2	BNT-A2	B-A2	BV-A2	BW-A2	BWV-A2	BWS-A2
DigiWx Advisor - FBO – Dial In	A3	BNT-A3	B-A3	BV-A3	BW-A3	BWV-A3	BWS-A3
DigiWx Advisor - FBO – Internet - Dial In	A4	BNT-A4	B-A4	BV-A4	BW-A4	BWV-A4	BWS-A4
With							
DigiWx Voice – UNICOM	V1	BNT-A*-V1	B-A*-V1	BV-A*-V1	BW-A*-V1	BWV-A*-V1	BWS-A*-V1
Or							
DigiWx Voice VHF	V2	BNT-A*-V2	B-A*-V2	BV-A*-V2	BW-A*-V2	BWV-A*-V2	BWS-A*-V2

Table 1
DigiWx Configurations

* DigiWx Voice requires the presence of one of the DigiWx Advisor modules – A1, A2, A3 or A4.

** All systems are supplied with one Hand Held Display Unit.

A solar power option is available for all configurations and is denoted by appending "-SP" to the above designators.

Details of the configurations in the shaded boxes above are listed as examples.

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BNT-H	Dual Barometer DCP, wall mount, Handheld Receiver (HHDU)
B-A1	Dual Barometer DCP, Tower Mount, HHDU, DigiWx Advisor-FBO
BV-A3	Dual Barometer DCP, Visibility, Tower Mount, HHDU, DigiWx Advisor-FBO-Dial In
BW-A*-V1	Dual Barometer DCP, Tower Mount, Wind Speed and Direction, Temperature and Dewpoint, HHDU, DigiWx Advisor A1, A2, A3 or A4, DigiWx Voice on UNICOM
BWV-A*-V2	Dual Barometer DCP, Tower Mount, Wind Speed and Direction, Temperature and Dewpoint, HHDU, Visibility, DigiWx Advisor A1, A2, A3 or A4, DigiWx Voice on Dedicated VHF

2.0 Lowest Level Field Replaceable Components Matrix

The following table illustrates the lowest possible field replaceable unit (FRU).

PARTS LIST

ITEM	PART #	DESCRIPTION	QTY	INSTALLATION REF
1	80010	Instruction Manual	1	-
2	80035	HHDU User Manual	1	-
3	6795-01	Hand Held Receiver	1	-
4	80089	Pole and Harness	1	Figs 5, 6, 7, 15, & 16
5	80018	Computer and Monitor	1	Fig 18
6	22167	Cross Arm	1	Figs 5a & 7
7	22168	Channel	1	Fig 6
8	6794-01	DCP Enclosure Assy	1	Fig 8
9	80014	Wind Speed Bottle	1	Fig 10
10	80015	Wind Direction Bottle	1	Fig 11
11	80016	Wind Speed Cups	1	Fig 10
12	80017	Wind Direction Vane	1	Fig 11
13	ZXSRS8HC	Solar Radiation Shield	1	Fig 12
14	R13HYCLIPS3	Temperature/Humidity Sensor	1	Fig 12
15	ZXMUF4502	Antenna	1	Fig 5a
16	8720-01	Harness, Tower	1	Fig 5
17	8721-01	Harness, Power	1	Fig 5a
18	8728-01	Cable, Antenna	1	Fig 5a
19	ZX1324U2	Cap, End	2	Fig 10 & Fig 11
20	ZX1242DPCHR	Eye Strap	1	Fig 5a
21	80003	Battery Bracket	1	Fig 15
22	80003-1	Battery Box	1	Fig 16
23	80003-2	Solar Panel	1	Fig 14
24	80057	Solar Panel Mounting Kit	1	Fig 14
25	ZXRPG125	Weights	3	Fig 5
26	ZX3827T34	Nylon Rope	1	Fig 6
27	ZX4491K42	Cap Plug, Red	6	Fig 10 & Fig 11
28	ZXS56	Solar Controller	-	Fig 16
29	SCP30S15DN	Power Supply	1	Fig 17
30	ZXA8R84	Junction Box and circuit breaker	1	Fig 17
31	80152	Battery backup power cable	1	Fig 17
32	80009	Ground Cable	1	Figs 6 & 17
33	80090	Lightning Rod	1	Fig 5a
34	80097	Mounting Plate	1	Fig 13
35	80091	Data Comm Cable	1	-
36	80087	DCP Mounting Kit	2	Fig 9
37	90000	Visibility Sensor	1	Fig 13
38	80098	Hardware Kit, Visibility meter	1	Fig 13
39	92000	Day Night Sensor	1	Fig 13
40	SFL612100	Power Supply	1	Fig 17

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ITEM	PART #	DESCRIPTION	QTY	INSTALLATION REF
41	SFL612100	Power Supply	1	Fig 17
42	LPC 10262-7?	Surge Suppressor	1	Fig 17
43	80040	DDR & Power Supply	1	Fig 19
44	80041	DDR Comm Cable	1	Fig 19
45	80039	RIF	1	Fig 19
46	90001	Calibration Kit	1	--
47	80109	Obstruction Light and wiring harness kit	1	Fig 5a
48	80110	Base Transceiver	1	Fig 5a
49	80111	Pressure Vent Kit	2	Fig 5a
50	80113	ELDF Base Transceiver	2	Fig 5a
51	80156	MCIF	1	Fig 19

Table 2
Lowest Field Replaceable Components

3.0 Principles of System Operation

Once every 5 seconds, a proprietary digital message containing all the weather information and DCP system status is transmitted from the DCP to the HHDU, and the DDR and DATU via a 464 MHz FM link. This information is displayed directly by the HHDU, and decoded by the DDR and passed to the DATU as an ASCII string. The information is then parsed by the DATU and made available to various users through on screen displays, synthesized voice audio information via pilot activated Unicom, endless loop synthesized voice audio information via dedicated frequency Unicom, telephone dial in via an audio modem, and if available, through an Internet link.

Figure 2 displays this information flow.

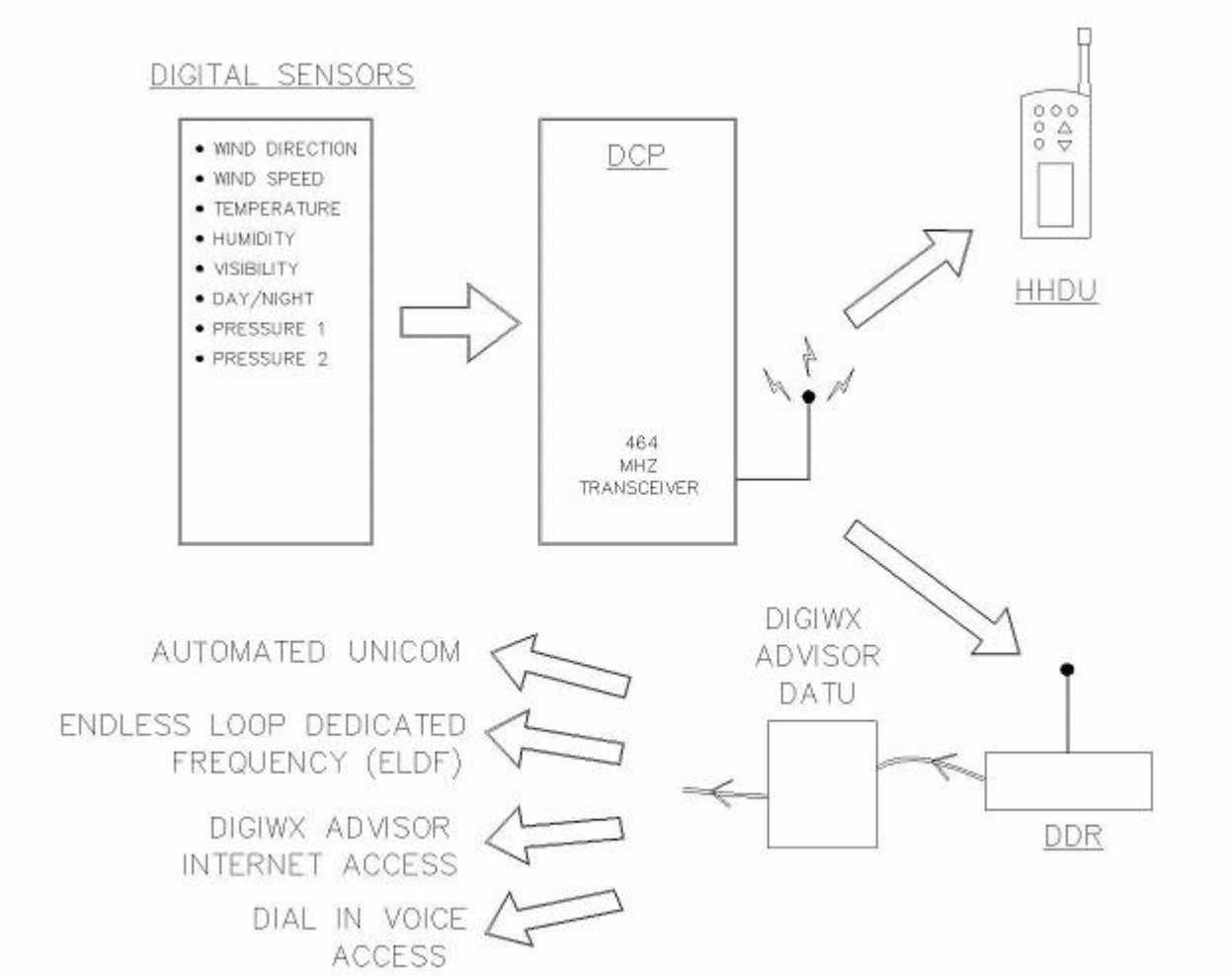

Figure 2
Information Flow

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3.1 DATU (Data Acquisition Terminal Unit) and Peripheral Devices

The DATU consists of 5 basic modules:

1. A digital data receiver (DDR) that links the sensors and DCP to the PC based user interface.

2. A PC and peripherals meeting at least the following requirements:

    Dell Optiplex GX270 PC
    Minimum of 128MB RAM
    20GB Hard Drive
    1 GHz Pentium Processor
    Windows XP Home Edition
    Voice Modem V.92
    Sound Card (Sound Blaster Compatible)
    Network Interface Card (NIC) 10MB Minimum
    Monitor

3. A radio Interface (RIF) that links the MCIF with the PC

4. A Microphone Click Interface (MCIF) that links the VHF transceiver with the PC and the RIF.

5. An aviation VHF base station, Technisonics TLC-100

Interconnect cables, adapters and power supplies

The DATU provides the user interface for all modes of operation other than the Hand Held Display Unit (HHDU). These interfaces are:

DigiWx Advisor display available locally and through an Internet link

DigiWx Voice available through a pilot request, a dedicated frequency endless loop audio broadcast, telephone dial in request.

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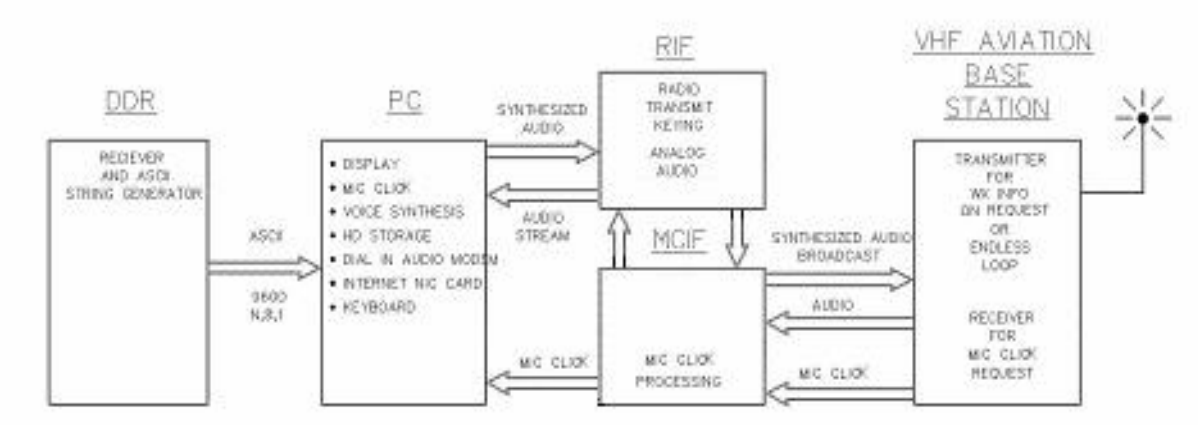


Figure 3
Illustration of Data Interface Modes

3.2 DCP (Data Collection Processor)

The DCP is located on the sensor tower, and collects, processes and communicates the weather and system status information. It also contains the 2 barometric pressure sensors, and battery charging circuitry for the backup battery supply. The 464 MHz transceiver listens before transmit and has automatic alternate channel capability.

Figure 4
Illustration of DCP Functions

3.3 DDR (Digital Data Receiver)

The DDR is a "black-box" component with power switch, AC adapter jack, antenna and DB9 RS-232 (serial port) connector. The DDR contains a receiver to receive data transmissions from

the DCP, and signal processing components to convert the received data into a serial ASCII data stream for input to the DATU's computer's Serial port interface.

3.4 RIF

The radio interface (RIF) is an analog audio processor that performs level control and compression on both radio to pilot activated computer and computer voice synthesizer to radio analog audio streams. The RIF also keys the aviation base station radio in voice activated and endless loop configurations. A microphone allows the transceiver to be used in a normal manner if required.

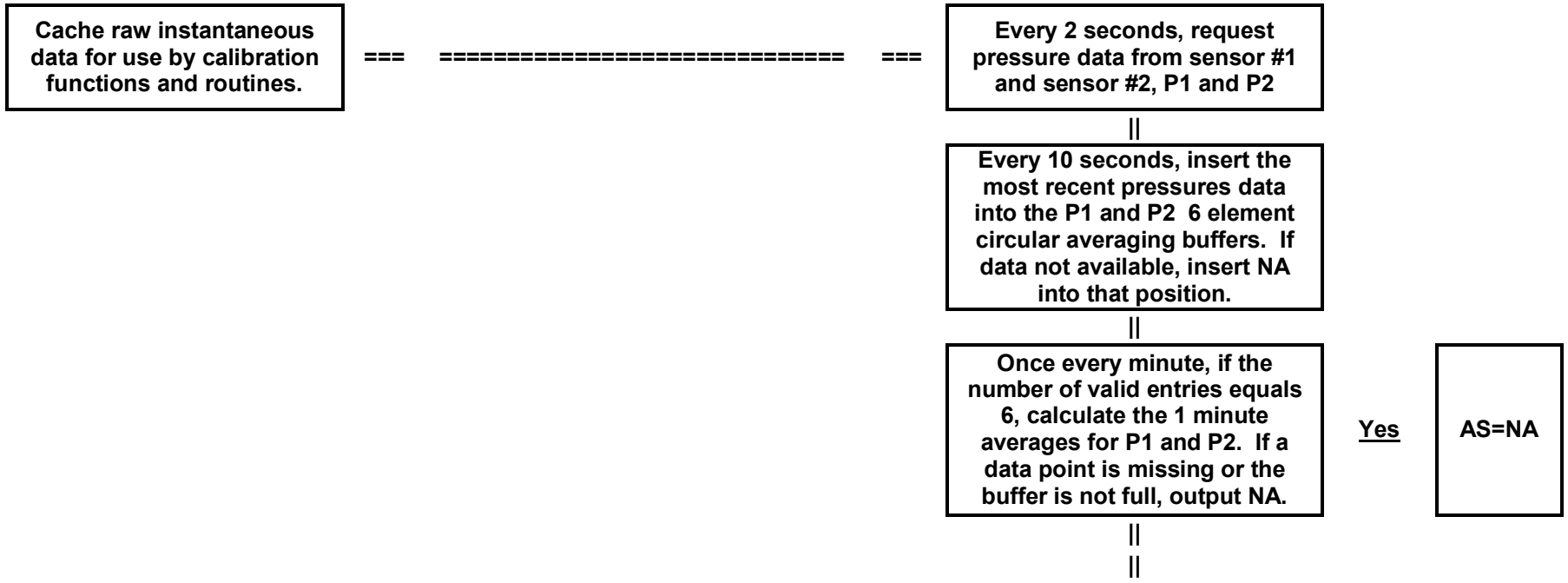
3.5 MCIF

The microphone click interface (MCIF) is both an audio pass through and digital processing device. All audio signals between the RIF and the radio pass through the MCIF with no processing. The MCIF processes radio squelch levels converting them to digital messages to the computer.

3.6 Dual Barometer Sensors

The dual barometric pressure sensors are located in the DCP enclosure, and provide serial pressure data to the altimeter reporting algorithm. The pressure sensors are sampled once every 10 seconds and 1 minute averages are constructed. The 2 averages are compared and the lower is used to compute field pressure. If the pressures differ by more than 0.04 inHg, the pressure is reported missing. The altimeter algorithm calculates and reports altimeter setting and density altitude. The altimeter setting is rounded to the nearest 0.01 inHg. The following flow chart describes the algorithm for calculating Altimeter Setting data:

Algorithm Flow Diagram for Pressure and Altimeter Setting Data


Cache raw instantaneous data for use by calibration functions and routines.
Every 2 seconds, request pressure data from sensor #1 and sensor #2, P1 and P2
Every 10 seconds, insert the most recent pressures data into the P1 and P2 6 element circular averaging buffers. If data not available, insert NA into that position.
Once every minute, if the number of valid entries equals 6, calculate the 1 minute averages for P1 and P2. If a data point is missing or the buffer is not full, output NA.
Yes
AS=NA

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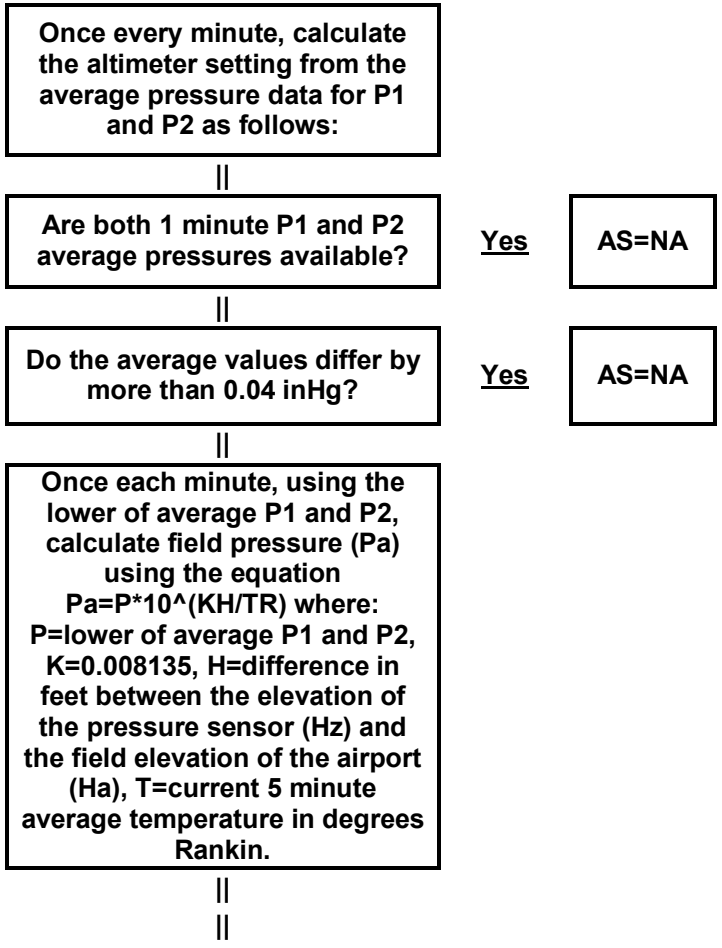
Algorithm Flow Diagram for Pressure and Altimeter Setting Data (Continued)


Once every minute, calculate the altimeter setting from the average pressure data for P1 and P2 as follows:
Are both 1 minute P1 and P2 average pressures available?
Yes
AS=NA
Do the average values differ by more than 0.04 inHg?
Yes
AS=NA
Once each minute, using the lower of average P1 and P2, calculate field pressure (Pa) using the equation Pa=P*10^(KH/TR) where: P=lower of average P1 and P2, K=0.008135, H=difference in feet between the elevation of the pressure sensor (Hz) and the field elevation of the airport (Ha), T=current 5 minute average temperature in degrees Rankin.

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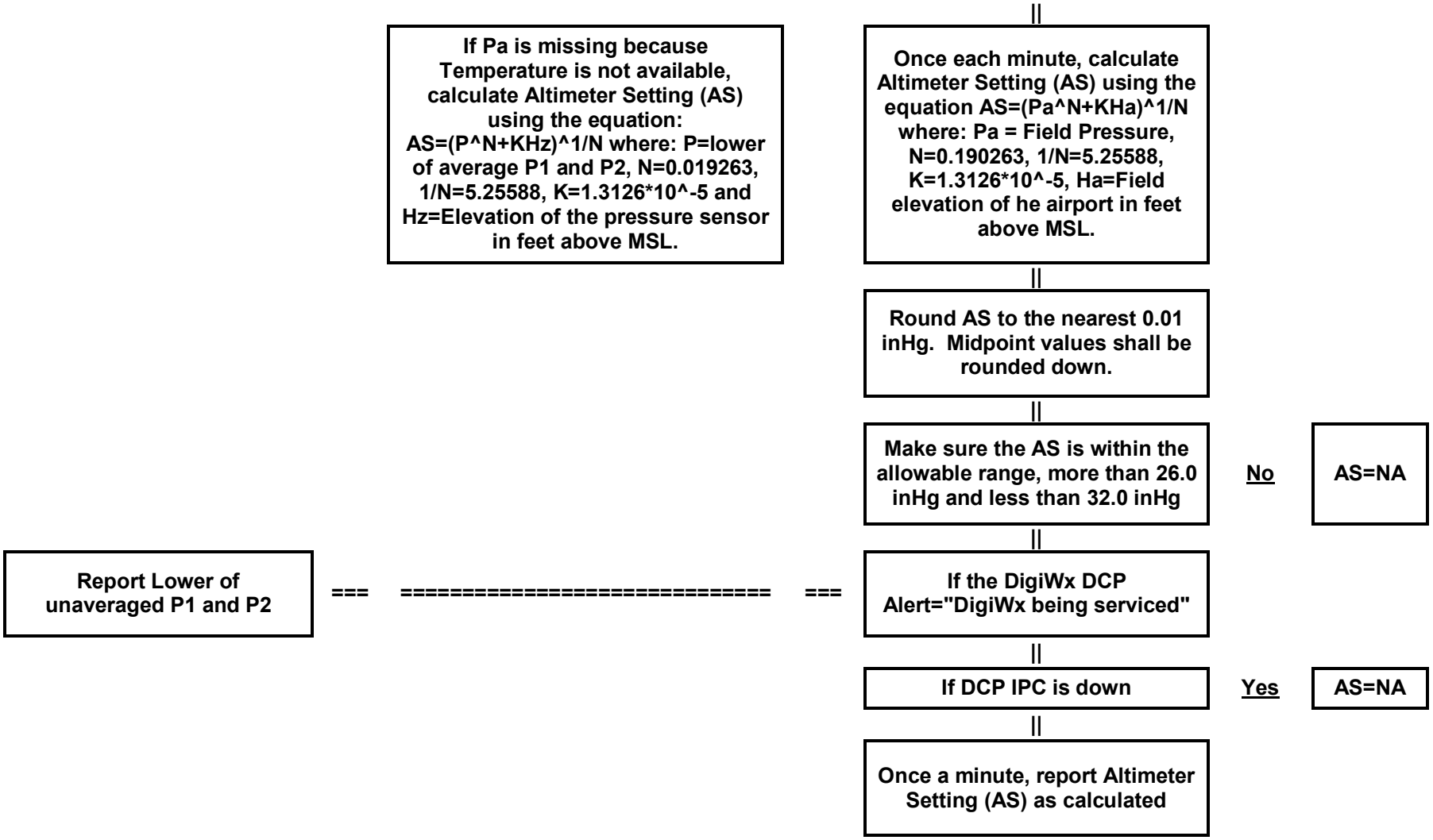
Algorithm Flow Diagram for Pressure and Altimeter Setting Data (Continued)


If Pa is missing because Temperature is not available, calculate Altimeter Setting (AS) using the equation: AS=(P^N+KHz)^1/N where: P=lower of average P1 and P2, N=0.019263, 1/N=5.25588, K=1.3126*10^-5 and Hz=Elevation of the pressure sensor in feet above MSL.
Once each minute, calculate Altimeter Setting (AS) using the equation AS=(Pa^N+KHa)^1/N where: Pa = Field Pressure, N=0.190263, 1/N=5.25588, K=1.3126*10^-5, Ha=Field elevation of he airport in feet above MSL.
Round AS to the nearest 0.01 inHg. Midpoint values shall be rounded down.
Make sure the AS is within the allowable range, more than 26.0 inHg and less than 32.0 inHg
No
AS=NA
Report Lower of unaveraged P1 and P2
If the DigiWx DCP Alert="DigiWx being serviced"
If DCP IPC is down
Yes
AS=NA
Once a minute, report Altimeter Setting (AS) as calculated

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3.7 Temperature Dew Point Sensor

The temperature and humidity sensor is located in the naturally aspirated enclosure mounted near the top of the sensor tower. This sensor provides digital information to the DCP for use in the temperature, dew point, humidity and density altitude algorithms.

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3.8 Visibility Sensor

The Belfort Model 6000 forward scatter visibility sensor including the Belfort Model 6300 day-night sensor operates in the polled mode. The DCP requests data once a minute and the 6000 responds with an ASCII data string including status of the visibility and day-night sensors, a one (1) minute average extinction coefficient (ExCo), and the ALS reading in footlamberts. The DCP then calculates visibility using the relationships:

Visibility =. 6213712 X 3.0/Exco Daytime in miles
Ln(.00336V)/V=Exco Night Time in miles

DCP Flow Diagram for Reported Visibility

Once each minute poll VS for daytime ExCo and ALS background illumination values.	**Non Valid Data**	**Mark "NA"**
Valid Data		
Determine Day /Night status **Day to Night =<0.5 fl** **Night to Day =>3.0 fl**		
||		
Calculate one (1) minute visibility in miles **Day = 0.62137X3.0/ExCo** **Night Ln(.00336V)/V=ExCo** **If Day/Night indeterminate, use Daytime visibility**		
||		
Store one (1) minute visibility value rounded to nearest 0.1 mile in ten (10) minute array, replacing oldest value if any		
||		

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DCP Flow Diagram for Reported Visibility (continued)		
On startup, report "NA" until all ten (10) elements are filled and a ten (10) minute harmonic can be calculated. Subsequently, report "NA" if less than 8 valid elements are present in the array.	**>>>>**	
Calculate and report variable visibility if the ten (10) minute average is greater than three (3) miles, all ten (10) array elements are filled, and the element to element differences, and sign reversals exceed threshold values	**>>>>**	**Incorporate in the METAR output**

The Visibility Sensor samples light forward scattered from the sample volume 37 times each second as Phase I and 37 times each second as Phase II. A synchronous rectifier detects the difference from an arbitrary zero. Also the power of the illuminating LED is sampled in the same way. The one (1) second and average differences are converted to Extinction Coefficient in inverse kilometers as a function of the difference, span and zero factors. The Extinction coefficient is converted to visibility using the formula V=3/ExCo in kilometers, and then converted to units of choice. Every 30 seconds, the ALS is polled by the Visibility Sensor, and the one (1) minute average information is stored in a buffer available through the Visibility Sensor as a response to an "FE" poll. The Visibility Sensor is polled once each minute by the DCP for the one (1) minute average visibility, and the 30 second average ALS data.

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Algorithm Flow Diagram for Visibility Sensor

Sample the forward scattered light thirty seven (37) times each second in Phase I and Phase II. Sample the illuminating LED power thirty seven (37) times each second as Pwr.

||

Subtract Phase II from Phase I to generate a one (1) second RcvrAvg

||

Add the one(1) second average to the Painting Average

||

Adjust the average for power:

$$AvgRcvr = RcvrAvg \times \frac{TxPwrCal}{Pwr}$$

Where TxPwrCal is a calibration value

||

Convert to Extinction Coefficient (ExCo) in inverse kilometers as

AvgExCo=f(AvgRcvr, Span, Zero)

Where Span and Zero are calibration values

>>>>>

>>>>>>>>>>>>>>>>>>>>>>>>

>>>>>

AvgExCo available for polling by the DCP

Where DCP polling command is “FL”

From ALS, one (1) minute average ALS data available for polling by the DCP

Where DCP Polling command is “FE”

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3.8.1 Ambient Light (Day Night) Sensor

The Belfort Model 6300 Ambient Light Sensor (ALS) measures the luminance of a 6º cone of sky as required for day / night determination. The visibility sensor powers the ALS and communicates with the ALS through a five-foot long cable by which the two sensors are connected. The Ambient Light Sensor (ALS) continuously samples background illumination, calculates ten (10) second averages, and once (1) a minute, calculates a one (1) minute average from the ten (10) second averages. If a valid one (1) minute average is calculated, this information is made available for a polling request by the Visibility Sensor (VS). If a valid one (1) minute average is not calculated, the output is marked "NA", and will deliver a null when polled.

<table>
<tr><td></td><td colspan="5">Algorithm Flow Diagram for ALS Sensor</td></tr>
<tr><td>Make ambient light measurements as fast as possible, from one (1) cycle per second to two hundred (200) cycles per second depending on illumination level.</td><td colspan="5" rowspan="3"></td></tr>
<tr><td>||</td></tr>
<tr><td>Once every ten (10) seconds, calculate a ten (10) second boxcar average</td></tr>
<tr><td>||</td><td colspan="5"></td></tr>
<tr><td>If a valid ten (10) second average is available, set the boxcar count to six (6)</td><td>Yes</td><td colspan="4">Six (6) valid boxcar averages available for one (1) minute average calculation</td></tr>
<tr><td>No</td><td></td><td colspan="4">Or</td></tr>
<tr><td>If a valid ten (10) second average is not available, set the boxcar count to last count less one(1)</td><td>=</td><td colspan="4">Five (5) or less valid boxcar averages available for one (1) minute average calculation</td></tr>
<tr><td colspan="2" rowspan="3"></td><td colspan="4">||</td></tr>
<tr><td>Once every ten (10) seconds, determine if at least five (5) active boxcar averages are available</td><td>yes</td><td colspan="2">Once every ten (10) seconds, calculate one (1) minute average</td></tr>
<tr><td>No</td><td></td><td colspan="2">Yes</td></tr>
</table>

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Algorithm Flow Diagram for ALS Sensor (Continued)				
	If the time since last availability of 75% of six (6) active boxcars is less than sixty (60) seconds, "coast" the last one (1) minute average	**=**	**Is a one (1) minute average available, current or coasted?**	**No ALS=NA**
			yes	
			New one (1) minute average passed to the Visibility Sensor and made available for polling by the DCP **Where DCP Polling command is "FE"**	

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3.9 Wind Speed Sensor

The wind speed sensor generates a pulse with the frequency proportional to the wind velocity. This pulse frequency is sampled once a second by the DCP and processed to construct the 2 minute average and gust information, along with sensor health and data quality determinations. Reported wind speed is rounded to the nearest knot.

3.10 Wind Direction Sensor

The wind direction sensor measures wind direction from 001 to 365 degrees and communicates with the DCP using a 7 bit gray code. The direction is sampled once a second and the 2 minute running average is computed every 5 seconds. Sensor health and data quality algorithms are also computed. Reported wind direction is rounded to the nearest 10 degrees.

3.11 System Power

System power is made available to the DCP through a power wire harness that is connected to an 115VAC powered 12VDC power supply, and/or a 12VDC deep discharge lead acid battery. The battery may be maintained by a solar cell and charge controller. If an AC powered 12VDC supply is used, the battery is maintained by a charge controller built into the DCP. Diagnostics on both supply channels are conducted by the DCP once a minute.

4.0 System Software Descriptions

4.1 DigiWx Advisor

The DigiWx Advisor™ is a Belfort proprietary software program that provides a PC-based graphical display of local weather data collected from the base DigiWx Weather Station. The data can be viewed on the DATU terminal at the airport FBO or, if the optional Web Service has been installed, on the web for pre-flight planning purposes and general airport operations. The DigiWx Advisor has an event manager capability that provides visual alerts of important, possibly critical, weather conditions such as high density altitude or excessive cross-wind component. The program captures all weather conditions to support aircraft accident or incident investigations. All historical data is saved subject only to limitations of hard disk space. If the Internet option has been installed, current data is also be transmitted to a central site where it is saved in a master database with on-line and off-line backups for data safekeeping. Historical data saved at the master database is retained indefinitely.

4.2 DigiWx Phone

The DigiWx Phone program is an optional feature that can be added to the DigiWx Advisor software. It provides the capability to automatically answer a phone line and will deliver current conditions as speech output. In order for the telephone answering and reporting system to function, a modem capable of voice output must be installed. If this option is installed, the modem will be configured at the Belfort factory.

The DigiWx Phone program will answer a call on the telephone line connected to the modem. The program will usually answer before the second ring at the modem. (The caller may hear three (3) or more rings depending upon the variables in the public telephone switching network.) Once DigiWx Phone has answered the call, the program will query the database to retrieve the most current reading. The program will generate speech output into the modem for: Airport name, NOTAM message (if any), current winds and gusts, altimeter, visibility (if sensor is installed), temperature, dew point, relative humidity, density altitude and condensation altitude. The program will repeat the current conditions and will then terminate the call and hang up the phone line.

Stale data threshold – A stale data threshold is pre-configured at the Belfort factory. If the most current data reading is older than the current clock time minus the stale data threshold interval, no weather parameters will be shown, and “Current data not available” will be output instead of the date and time. In the event that the stale data threshold has been exceeded, the speech message output will consist of the airport name and the phrase “Current data is not available.”

4.3 DigiWx Voice

A separate program, DigiWx Voice, provides speech output through the CTAF/Unicom radio upon demand from a pilot's radio. DigiWx Voice is installed and configured at the Belfort factory. There is no operator setup or configuration required.

4.4 DCP Configuration software (ASOSDCP102)

ASOSDCP102 is a Belfort proprietary program that facilitates interactive dialog between the technician and the DigiWx DCP to enter and modifying local settings. An automatic altimeter setting calibration program is also included. All settings are password protected to prevent unauthorized changes.

5.0 Applicable Documents & List of acronyms

5.1 Applicable Documents

FAA AC No: 150/5220-16C Automated Weather Observing Systems (AWOS) For Non-Federal Applications

5.2 List of Acronyms

AC	Alternating Current
ALS	Ambient Light Sensor
AVG	Average
AWOS	Automated Weather Observing System
BIT	Built-In-Test
CTAF	Common Traffic Advisory Frequency
DATU	Data Acquisition Terminal Unit
DC	Direct Current
DCP	Data Collection Processor
DDR	Digital Data Receiver
DMM	Digital Multi-meter
DSL	Digital Subscriber Line
DTMF	Dual-Tone Multi-Frequency
ELDF	Endless Loop Dedicated Frequency
EPROM	Erasable Programmable Read-Only Memory
ExCo	Extinction Coefficient in inverse kilometers
FAA	Federal Aviation Administration
FBO	Facility Base Operator
FCC	Federal Communication Commission
FRDF	Facility Reference Data File
FRU	Field Replaceable Unit
FSDO	Flight Standards District Office
Hg	Mercury
HHDU	Hand Held Display Unit

ICAO	International Civil Aviation Organization
ID	Identification
INOP	Inoperative
KT	Knots
LED	Light Emitting Diode
LRU	Lowest Replaceable Unit
MCIF	Microphone Click Interface
MHz	MegaHertz (million Hertz)
MOU	Memorandum of Understanding
MSL	Mean Sea Level
NAVAID	Navigational Aid
NIST	National Institute of Standards and Technology
NOTAM	Notice To Airmen
OMM	Operations and Maintenance Manual
RAF	Regional Airway Facilities
REL HUM	Relative Humidity
RIF	Radio Interface
RPM	Revolutions Per Minute
T1	T-carrier 1 (digital transmission line, 1.544 Mbps, 24 voice channels)
UHF	Ultra High Frequency
UNICOM	Universal Integrated Communications (System)
VAC	Volts Alternating Current
VDC	Volts Direct Current
VDD	Version Description Document (DigiWx® Configuration Baseline Document)
VDU	Video Display Unit
VHF	Very High Frequency
VS	Visibility Sensor